

**Audio Effects Synthesizer with or without Analyzer****Related Applications**

This application claims priority benefits of UK Patent Application No. 9616755.6  
5 filed August 9, 1996 and PCT Application No. PCT/GB97/02159 filed August 8, 1997.

**Field of the Invention**

A method and apparatus are provided for simulating an audio effect processor,  
and more particularly, for applying an impulse response or impulse responses selected  
10 from a plurality of stored impulse responses to an input signal to achieve a desired  
output.

**Background of the Invention**

In audio recording for music or film it is often desired to pass an audio signal  
15 through an effect unit to alter the sound in a desirable way, for example, in film work a  
recording may be made to sound as if it were coming through a telephone, from a  
distance or in a room with characteristic sound quality even though the original sound  
was recorded in a dead acoustic of a studio. In music work more severe distortions may  
be required, for example passing the signal through a guitar amplifier and speaker which  
20 is allowed to distort and back into a microphone, or through an analogue recording cycle  
onto and back from magnetic tape which is often considered to add a desirable sound  
quality.

Many devices exist to process signals in these ways, some specific to individual  
effects and some programmable to generate a range of effects on demand. The purpose  
25 of this invention is to allow the simulation of a large variety of such effects and further to  
allow existing effects to be analyzed and the characteristics of the effect to be stored and  
simulated on demand.

**Summary of the Invention**

30 In accordance with the above, this invention provides a method and apparatus for  
simulating an audio effect processor which includes storing the impulse response of the

audio processor for at least two impulses, repeatedly assessing a characteristic of an input signal, selecting at least one of the impulse responses to apply to the input signal in dependence on the result of the assessment, and applying the selected impulse response to the input signal to derive an output signal. The storing of the impulse response may  
5 involve storing at least two sets of digital samples representing the at least two impulse responses and the applying of the stored impulse response may involve convolving each of a first set of digital samples representing the assessment of the characteristic of the input signal with the selected set of digital samples representing the selected impulse response appropriate to the characteristic to give a second series of digital samples  
10 representing the output signal. The assessing of a characteristic of the input signal may also involve assessing its amplitude and the selecting of an impulse response to apply to the input signal may involve determining whether the amplitude of the input signal is above or below a predetermined threshold. For this embodiment, the step of selecting an impulse response to apply to the input signal may involve determining whether or not the  
15 amplitude of the input signal falls within a predetermined range, applying more than one impulse response to the input signal if the result of the determination is that the amplitude of the input signal falls within the predetermined range and deriving the output signal therefrom. A plurality of impulse responses may be applied to the input signal, the applied impulse responses being applied in proportions which sum substantially to  
20 one. The proportions of the impulse responses applied to the input signal may be dependent on the position of the amplitude of the input signal within the predetermined range.

The selecting of an impulse response to apply to the input signal may involve detecting a user input and selecting the impulse response dependent thereon.

25 Alternatively, the selecting of an impulse response to apply to the input signal may involve monitoring a time dependent variable and selecting an impulse response in dependence thereon. Impulse responses may also be stored for a plurality of different audio processors.

The foregoing and other objects, features and advantages of the invention will be  
30 apparent in the following more particular description of preferred embodiments of the invention as illustrated in the accompanying drawings.